



[illegible]

[0006] Some automatic transmissions are, for instance, provided with a control lever which can be disposed in a first stable position for the actuation of the automatic operating method and in a second stable position which controls the engagement of the manual operating method; the operator may also displace the lever disposed in the second position in opposite directions in order to carry out unit increments/decrements of the gear engaged.

[0008] In particular circumstances, the strategies for the choice of the transmission ratio engaged in the automatic method may not coincide with the choice that the driver would make. In such circumstances, it is advantageous for the operator to be able to modify the gear that has been selected and engaged in a fully automatic manner.

## Summary of Invention

[0011] More particularly, the object of the present invention is to provide a system that allows the generation of commands of manual type without the need to de-activate

the operating method of automatic type.

[0012] This object is achieved by the present invention which relates to a control method for an automatic transmission in which a first control system of automatic type receives as input data signals and processes them in order to generate drive signals for the transmission and automatically to set an optimum transmission ratio, this automatic transmission further comprising a second control system of manual type which receives as input control signals generated by an operator in order to generate drive signals for the transmission and manually to set a transmission ratio, characterised in that it comprises the stages of activating the first control system and automatically setting a transmission ratio, detecting the presence of a manual command given by an operator to modify the transmission ratio in use, performing the manual command given by the operator by modifying the transmission ratio set automatically, silencing the first control system for a predetermined time interval  $T_{sleep}$  such that the transmission ratio set following the manual command is not modified following an automatic gear change request from the first control system and attributing the control of the automatic transmission to the first control system.

## Brief Description of Drawings

[0013] The invention is described below with particular reference to the accompanying drawings which show a preferred embodiment thereof and in which:

[0014] Fig. 1 is a diagram of an automatic transmission of an engine-driven vehicle operating according to the method of the present invention;

[0015] Fig. 2 is a block diagram showing the steps of the method of the present invention.

## Detailed Description

[0016] In Fig. 1, an automatic transmission (also called a robot transmission) of an engine-driven vehicle (which may be of any type, but is not shown for ease of description) is shown overall by 1.

[0017] The engine 2, in particular an internal combustion engine, has an output shaft 4 connected, by means of the interposition of a clutch 5, with the input shaft 6 of a gear



(shown by UP and DOWN in Fig. 1) in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged.

[0025] A push-button P is also provided and can be actuated to select the automatic operating method.

[0026] It will be appreciated that the selector device 17 may have a structure differing from that illustrated, and may for instance comprise a lever member 20 which can be disposed in a first unstable position (not shown) in order to actuate an automatic operating method of the transmission 1 and in a second stable position (not shown).

[0027] In this case, the lever member 20 may also be manually displaced from the second stable position to two opposite unstable positions in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged.

[0028] The selector device 17 may also have a structure formed by steering-wheel commands (levers or push-buttons) in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged. In this case, the selector device is provided with a push-button which can be actuated to select the automatic operating method.

[0029] The electronic unit 15 comprises a first control system 22 of automatic type which receives as input the data signals and the control signals and processes them in a known manner in order to generate drive signals OPEN/CLOSE, SEL, ENG/DIS and to set an optimum transmission ratio. As is known, during the operating method of automatic type, the control system 22 detects the most appropriate external conditions (vehicle speed, rpm, accelerator pedal position, engine torque, etc.) for commanding a unit increment or decrement of the gear engaged. The control of the gear change is thus fully delegated to the control system 22 of the transmission. The use of commands dedicated to gear change requests is limited solely to requests for reverse gear and neutral.

[0030] The electronic unit 15 further comprises a second control system 24 of manual type which receives as input the data signals and processes them in a known manner in order to generate drive signals OPEN/CLOSE, SEL, ENG/DIS and to set a





had requested is in any case performed.

[0044] When the block 150 has detected discordant requests, there is a transition to the block 130 which performs the command set manually, i.e. it generates drive signals adapted to bring about a unit gear increment (UP-SHIFT) or a unit gear decrement (DOWN-SHIFT) as a function of the manual actuation of the lever member 20 by the operator.

[0045] In operation, the method of the present invention manages the first automatic control system 22 and the second manual control system 24 by establishing the priorities between the gear commands set by the operator and those desired by the automatic control system 22; the following cases are in particular managed:

[0046] – gear change request from the operator followed by a gear change request from the automatic system 22 the gear change request from the operator is performed and for an immediately successive interval no account is taken of the gear changes requested by the automatic control system 22. The gear change request from the driver is maintained for at least a time-out (de-activation interval  $T_{sleep}$ ) defined by the control system of the transmission. At the end of the time-out, the system returns to automatic management. This prevents a gear change request from the automatic management from following too closely on the request from the operator;

[0047] – gear change requested automatically followed by a gear change request from the driver: in this case there are two separate situations:

[0048] – concordant gear changes: the gear change requested by the operator is ignored as it would duplicate the gear change that the control system 22 is already requesting automatically. It is assumed in this case that the operator has not had time to become aware that the system is in the process of performing a gear change;

[0049] – discordant gear changes: account is taken of the operator's request.

[0050] This consequently provides a new method of operation in which, with the automatic method engaged, a gear change request from the driver is implemented and is interpreted as an instantaneous gear change suggestion without de-activating the automatic method and without the need for transition to the manual method.



